

What is claimed:

1. A transparent, non-elastomeric, high hardness, impact resistant polyurethane material comprising the reaction product of:

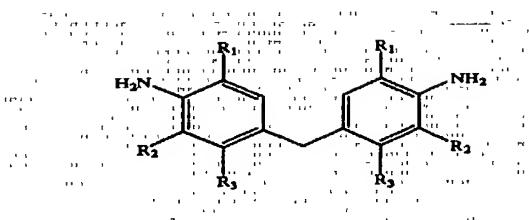
(a) a polyurethane prepolymer prepared by reaction of an aliphatic or cycloaliphatic diisocyanate with (i) at least one OH-containing intermediate having a weight average molecular weight of from about 400 to about 2000 selected from the group consisting of polyester glycols, polycaprolactone glycols, polyether glycols, polycarbonate glycols, and mixtures thereof, and (ii) a triol in an amount equal to 0.01 to 0.5 equivalents based upon a total of 1.0 equivalents of (i) and (ii), and wherein the diisocyanate is reacted with the triol and OH-containing intermediate in an equivalent ratio of about 2.5 to 4.0 NCO/1.0 OH; and

(b) at least one aromatic diamine curing agent selected from the group consisting of 2,4-diamino-3,5-diethyl-toluene, 2,6-diamino-3, 5-diethyl-toluene and mixtures thereof in an equivalent ratio of about 0.85 to 1.02 NH₂/1.0 NCO.

2. The polyurethane material of claim 1, wherein the triol is added in an amount equal to 0.01 to 0.2 equivalents based upon a total of 1.0 equivalents of (i) and (ii).

3. The polyurethane material of claim 1, wherein the triol is added in an amount equal to 0.06 to 0.15 equivalents based upon a total of 1.0 equivalents of (i) and (ii).

4. The polyurethane material of claim 1, wherein the polyurethane material is the reaction product of said polyurethane prepolymer, said at least one first diamine curing agent, and at least one second diamine curing agent selected from the group consisting of compounds of the formula:



wherein R₁ and R₂ are each independently selected from the group consisting of methyl, ethyl, propyl and isopropyl groups and R₃ is selected from the group consisting of hydrogen and chlorine.

5. The polyurethane material of claim 1, wherein the cycloaliphatic diisocyanate is selected from the group consisting of 4,4'-methylenebis(cyclohexyl isocyanate), 3-isocyanato-methyl-3,5,5-trimethylcyclohexyl-isocyanate, meta-tetramethylxylene diisocyanate, and mixtures thereof.

6. The polyurethane material of claim 1, wherein the polyurethane material has a heat distortion temperature of at least 210°F at 264 psi.

7. The polyurethane material of claim 1, wherein the polyurethane material has a heat distortion temperature of at least 250°F at 264 psi.

8. The polyurethane material of claim 1, wherein the polyurethane material has a heat distortion temperature of at least 300°F at 264 psi.

9. The polyurethane material of claim 1, wherein the polyurethane material is optically clear having a luminous transmittance of at least about 80%.

10. The polyurethane material of claim 1, wherein a 0.25-inch thick sheet of the polyurethane material has a V-5O 0.22 caliber FSP rating of at least 1100 feet per second.

11. The polyurethane material of claim 1, wherein the diamine curing agent is reacted with the prepolymer in an equivalent ratio of about 0.90 to 1.0 NH₂/1.0 NCO.

12. The polyurethane material of claim 1, wherein the weight average molecular weight of the OH-containing intermediate is from about 400 to about 1000, and the OH-containing intermediate is selected from the group consisting of: (a) esterification products of adipic acid with one or more diols selected from the group consisting of 1,4-butanediol, 1,6-hexanediol, neopentyl glycol, and 1,10-decanediol; (b) reaction products of E-caprolactone with one or more diols selected from the group consisting of 1,4-butane diol, 1,6-hexane diol, neopentyl glycol, and 1,10-decanediol; (c) polytetramethylene glycol; (d) aliphatic polycarbonate glycols; and (e) mixtures of such OH-containing intermediates.

13. The polyurethane material of claim 1, wherein the cycloaliphatic diisocyanate is an isomeric mixture of 4-4'-methylenebis(cyclohexyl isocyanate) which comprises at least 20 percent of the trans,trans isomer of 4,4'-methylenebis(cyclohexyl isocyanate).

14. The polyurethane material of claim 1, wherein the prepolymer further comprises a UV-stabilizer selected from the group consisting of benzotriazoles, hindered amine light stabilizers and mixtures thereof.

15. The polyurethane material of claim 1, wherein the prepolymer further comprises an anti-oxidant, which is a multifunctional hindered phenol.

16. The polyurethane material of claim 1, wherein the polyurethane material has a stress craze resistance of >7000 pounds per square inch when measured using isopropanol.

17. The polyurethane material of claim 1, wherein said diamine curing agent is color-stabilized.

18. An eyewear lens made from the polyurethane material according to claim 1.

19. The eyewear lens of claim 18, wherein said lens is selected from the group consisting of sun lenses, ophthalmic lenses and protective lenses.

20. A transparent non-elastomeric, high hardness, impact resistant polyurethane material comprising the reaction product of:

- (1) a polyurethane prepolymer prepared by reaction of a diisocyanate selected from the group consisting of 4,4'-methylenebis(cyclohexyl isocyanate), 3-isocyanato-methyl-3,5,5-trimethylcyclohexyl-isocyanate, meta-tetramethylxylene diisocyanate, and mixtures thereof with (a) at least one OH-containing intermediate having a weight average molecular weight of from about 400 to about 2000 selected from the group consisting of: (i) esterification products of adipic acid with one or more diols selected from the group consisting of 1,4-butanediol, 1,6-hexanediol, neopentyl glycol, and 1,10-decanediol; (ii) reaction products of E-caprolactone with one or more diols selected from the group consisting of 1,4-butane diol, 1,6-hexane diol, neopentyl glycol, and 1,10-decanediol; (iii) polytetramethylene glycol; (iv) aliphatic polycarbonate glycols; and (v) mixtures of such OH-containing intermediates, and (b) a triol in an amount equal to 0.06 to 0.15 equivalents based upon a total of 1.0 equivalents of (a) and (b), and wherein the diisocyanate is reacted with the triol and OH-containing intermediate in an equivalent ratio of about 2.5 to 4.0 NCO/1.0 OH; and
- (2) at least one diamine curing agent selected from the group consisting of 2,4-diamino-3,5-diethyl-toluene, 2,6-diamino-3,5-diethyl-toluene, and mixtures thereof, in an equivalent ratio of about 0.95 to 1.02 NH₂/ 1.0 NCO, wherein the polyurethane material has a heat distortion temperature of at least 300°F at 264 psi.